SECTION 8B

SUPPLEMENTAL RESTRAINT SYSTEM(SRS)

Caution: Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

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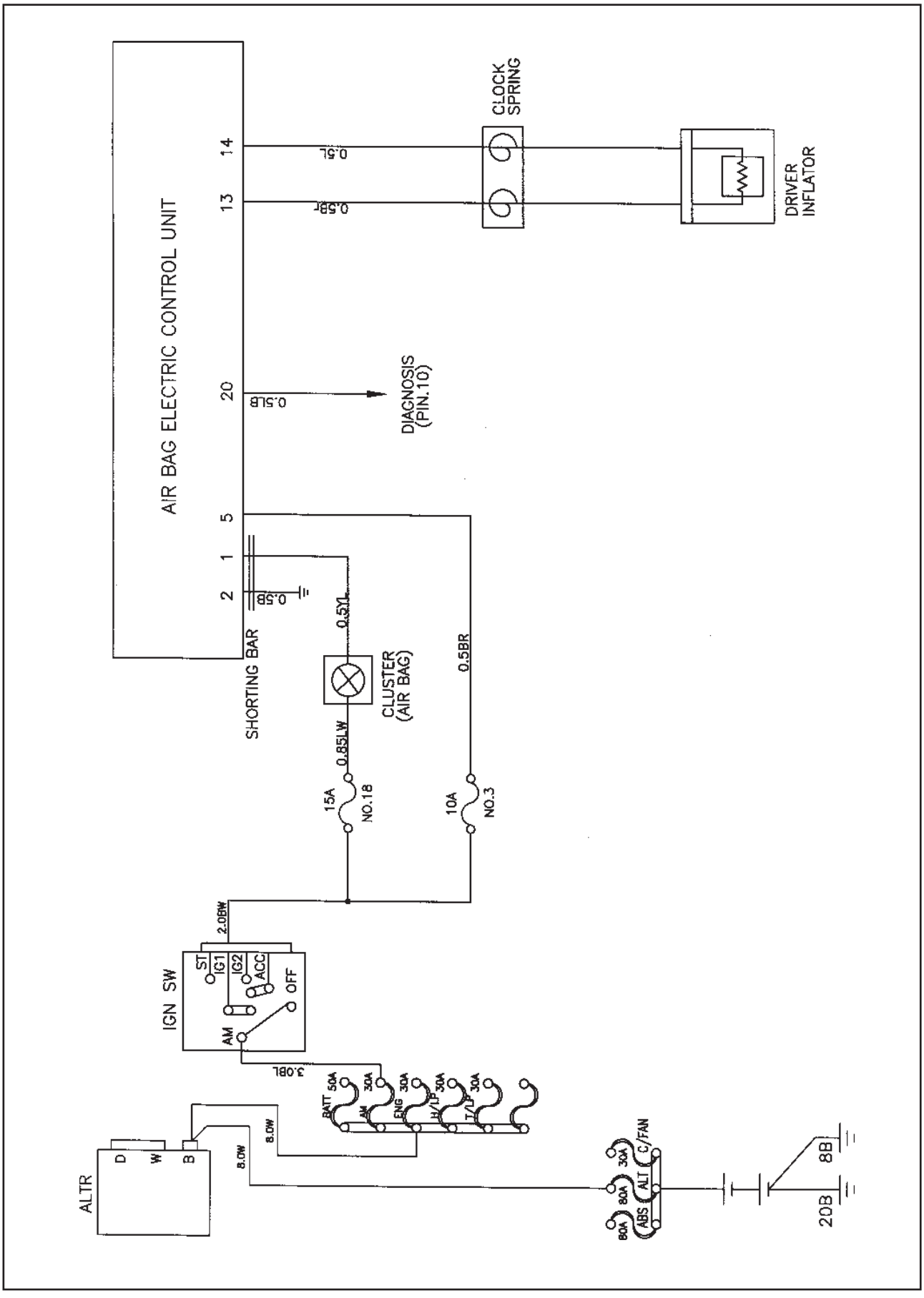
SPECIFICATIONS

GENERAL SPECIFICATIONS

Application	Description
Air bag System Deployment Time	< 20ms
Detection Time	< 5ms
Operating Temperature	-40℃ ~ +85℃
Storage Temperature	-40℃ ~ +90℃
Air Bag Replacement Interval	Every 10-year after installation
Voltage Range	9-16V
Current Consumption	5ms after ignition switch ON < 1A, 5ms ~ 5sec. <300mA, after 5sec. < 100mA
Acceleration Range	+/-50g
Max. Acceleration	+/-600g pulse
Voltage Ramp	0.5 ~ 2.0 V/s
Energy Reservation	150ms after battery disconnection
Inflator Ignition Energy	4.3mJ
Squib Resistance	2.15 ± 0.35 Ω
Air Bag Warning Lamp ON Time (When Ignition ON)	6 sec.

SCHEMATIC AND ROUTING DIAGRAMS

AIR BAG



CAUTIONS

Failure to follow the correct service procedure can cause air bag damage or personal injury due to unexpected air bag deployment. Before service (removal and installation of part, check for replacement), please be weal noticed of following items for your correct service.

1. For service, turn the ignition switch to 'LOCK' position and wait for 30 seconds after disconnecting the negative battery cable.
2. If the vehicle collapsed, remove the air bag ECU first to reserve the crash records.
3, Never use other vehicles' air bag components and replace with specified new part.
4. Never disassemble or repair the air bag module, air bag unit and wiring harness to re-use.
5. Replace the air bag module and air bag unit with new if it dropped, cracked or damaged.
6. Only qualified technicians in service shop should check or repair the air bag,
7. Before service, should be well noticed of warning labels on the vehicle.

A. Sun Visor Side

[Warning]

Pull down the sun visor and see SRS air bag warning lamp on the head lining.

B. Head Lining

[Warning]

1 . This vehicle is equipped with air bag. Air bag is supplemental device for the seatbelt. Fasten your seatbelt.
2. This air bag should be replaced by authorized supplier within replacement intervals.
3. When the ignition key is turned to ON position, SRS warning lamp will turn on for 6 sec. and go off. In this case, the system is normal.
   For the following cases, see service manual.
   - SRS warning lamp does not turn on.
   - SRS warning lamp does not go off.
   - SRS warning lamp continues to blink.

C. Steering Wheel Body Inner

[Warning]

Before removing the steering wheel, read service manual first. Set the front wheels straight forward and align the center position marks of SRS clock spring. Improper removal or installation of the steering wheel can damage the SRS components.

D. Engine Compartment

[Warning]

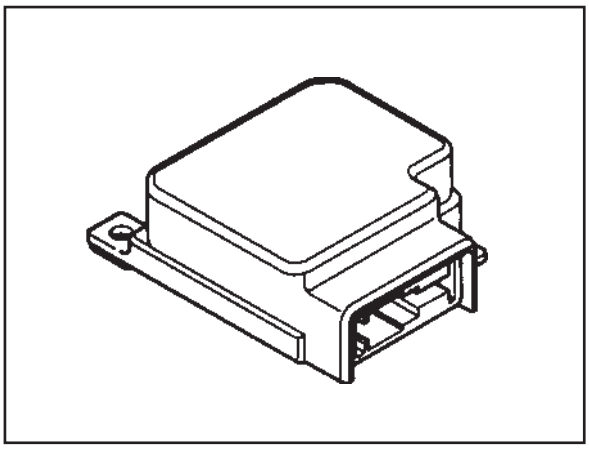
This vehicle is equipped with air bag. Before checking the engine compartment, read service manual first. Faultuy check and service can cause SRS air bag deployment and system defects that can be led to severe damage.

E. Battery Cable

[Warning]

Before disconnecting the battery power, read service manual first.

FUNCTION DESCRIPTION



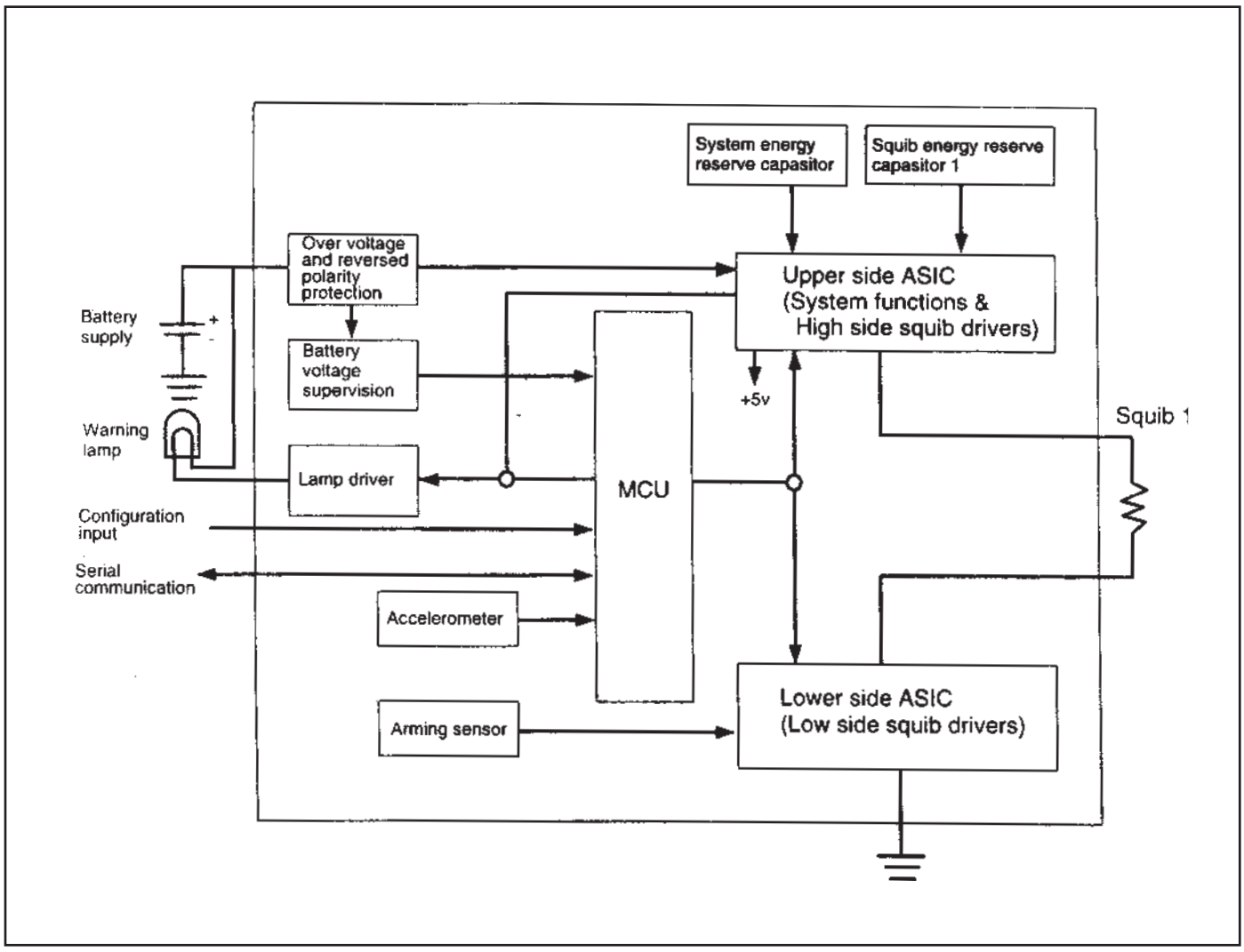
Air Bag Control Unit (AC4)

Air bag control unit (AC4) is installed on the center portion of the front floor tunnel.

It is a central control unit that control all functions and determines whether deploy the air bag or not with the collision signal from the built-in accelerometer sensor and has function of diagnosing system defects.

Internal air bag control unit is consisted as follows;

- Microprocessor
- ASICs (Upper side ASIC & lower side ASIC)
- Accelerometer sensor
- Arming sensor
- System energy backup condenser
- Squib energy backup condenser



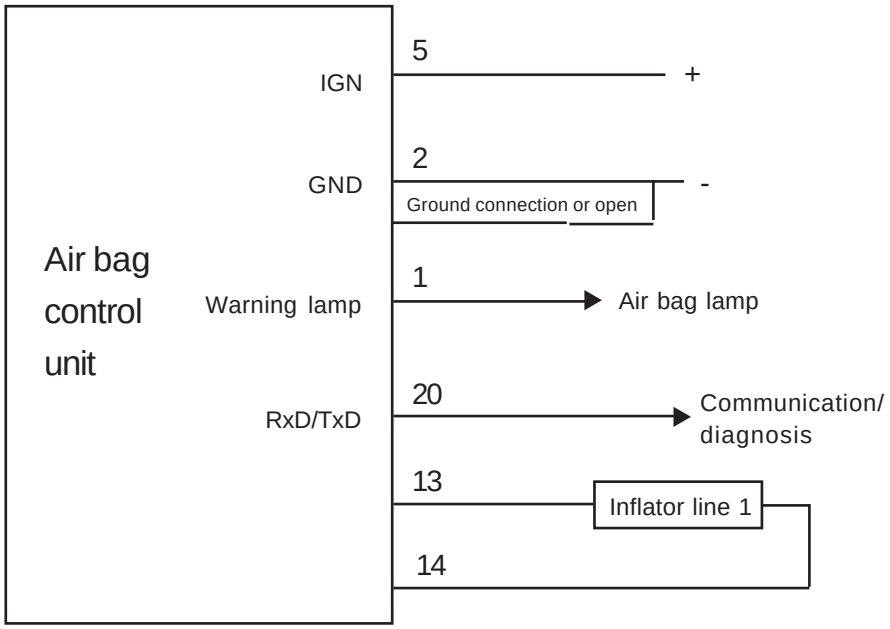
Input & Output Function

Electronic air bag control and diagnosis module is connected by full 30-pin connectors.

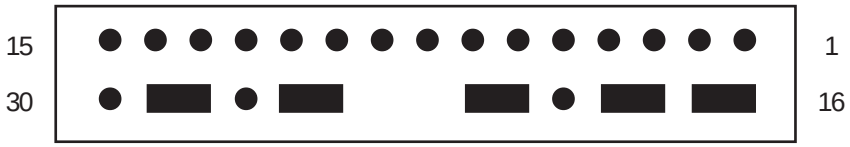
Input : ground

Output : 1 squib line, warning lamp

Input/output : communication, diagnosis



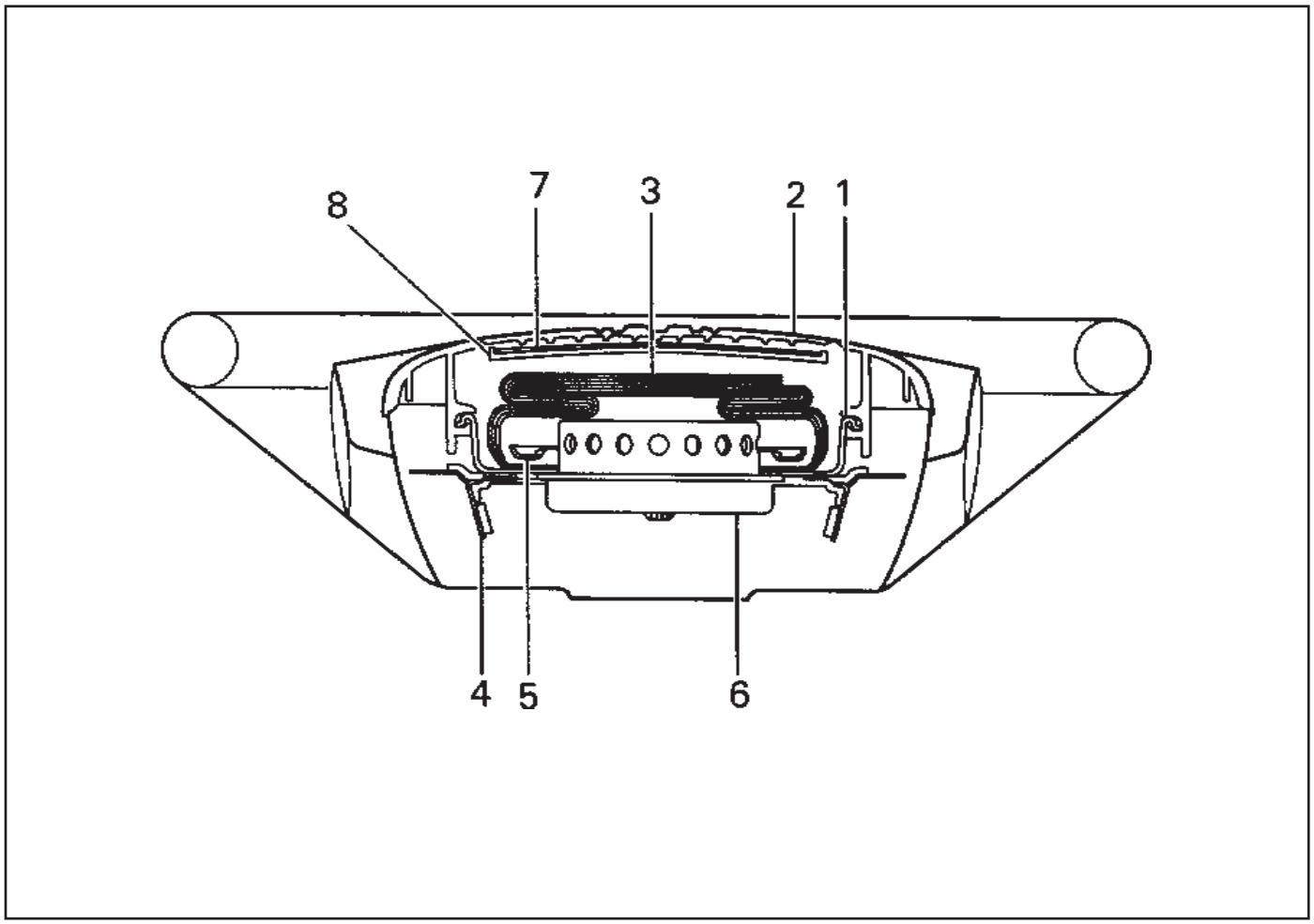
Connector Pins



1	Lamp	16	Shorting Bar
2	Ground	17	Shorting Bar
3	N/A	18	Shorting Bar
4	N/A	19	Shorting Bar
5	Ignition	20	Diagnosis
6	N/A	21	Shorting Bar
7	N/A	22	Shorting Bar
8	CONF	23	No Pin
9	N/A	24	No Pin
10	N/A	25	Shorting Bar
11	N/A	26	Shorting Bar
12	N/A	27	N/A
13	Squib Line 1(upper)	28	Shorting Bar
14	Squib Line 1(lower)	29	Shorting Bar
15	N/A	30	N/A

AIR BAG MODULE

Air bag module is installed in the pad of steering wheel center and inflator is consisted of igniter, explosives, gas generating material and bag. When crashed, the air bag control unit sends current to the air bag module through squib line and this current ignites as ignition energy (6mJ) momentarily igniting explosives and bag will be inflated by nitrogen gas protecting driver at the same and then deflates.



1 Air bag Module
2 Module Housing
3 Bag
4 Module Bracket
5 Retainer Ring
6 Inflator
7 Horn Switch
8 Backing Plate

DIAGNOSIS

DESCRIPTION

Air bag control unit continuously controls system function as follows during ignition ON or driving.

- Recognition of collision
- Internal diagnosis
- External diagnosis

If recognize or detect defects, warning lamp will turn on. If there is danger of improper deployment, the system will enter overall shutdown status and the air bag will not inflate.

Air bag control unit will store detected internal and external defects in the EEPROM.

System Control

Battery Voltage Check

Battery voltage will be monitored continuously. If voltage is out of normal operating range, all system diagnosis will stop and warning lamp turn on.

Battery Voltage (V)	Function
< 8.7	System diagnosis stops and warning lamp turns on
9 - 16	Normal operation range
> 16.3	System diagnosis stops and warning lamp turns on

Squib Diagnosis

It checks not only high (4.50.5) or low (1.40.5) resistance but also short resistance (1- 10k) status between the battery and ground to indicate defects in squib line by blinking warning lamp. Air bag control unit (AC4) can measure squib resistance.

Warning Lamp Turning On

Air bag control unit detects system defects during ignition ON or driving and displays following 2 warning lamps.

- Warning lamp ON: internal defects of the air bag control unit
- Warning lamp blinking: higher resistance than standard in the squib line or short at the battery or ground,

Safety Function Check

It checks defects during operation of the arming sensor If the sensor is shorted for more than 2 seconds, the module will enter overall shutdown mode.

Temperature Sensor

Function of the temperature sensor will be monitored continuously. If there is fault due to defective sensor or short, the lamp will turn on and program will take calibration temperature (25) of collision conditions.

Power Supply

Airbag control unit operates in 9-16v and the characteristic of the system has backup condenser to supply the power for max.150ms if there is power defect during collision.

Energy Reserve System

Energy reserve system is consisted of condensor and energy switch and will check following items continuously during system operation.

- High voltage
- Low voltage
- Low rating capacity
- Function of the energy reserve switch

If there is fault in the energy reserve system, warning lamp will turn on. And defects are found by continuous checking of the condenser voltage, the system will enter overall shutdown status for safety reason.

Shutdown Switch

There is 1 energy shutdown switch in the system and it will be checked during start-up. And it also checks that condenser is discharging properly. If shutdown switch is short, it will be detected during condensor voltage test.

If squib line fault is obvious, the warning lamp will turn on and the module will enter overall shutdown status.

Accelerometer Check

Accelerometer function will be checked during start-up. During operation, accelerometer off-set signal will be checked, If there is fault, module will enter overall shutdown status.

ASIC Overheat

Module monitors upper side ASIC overheats continuously. If overheated, the module will enter overall shutdown status.

Microprocessor Fault

Module checks EEPROM, ROM checksum and RAM during start-up. EEPROM tests checksum operation.

If RAM or ROM checksum is defective, module will not allow start-up continuously but will be re-set,

If EEPROM is defective, warning lamp will turn on and the module will enter overall shutdown status.

During operation, RAM will continuously verify the proper operation of temporary memory program data usage. If there is fault, the module will enter overall shutdown status and the warning lamp will turn on.

Watchdog Test

Watchdog function will be tested in start-up. If there is fault during the test, warning lamp will turn on and the module will enter overall shutdown status.

Diagnosis

Air bag control unit diagnoses each function in the intervals of 250ms - 20 sec. during start-up or driving to prevent unwanted air bag deployment. If there is defect, it turns on or blinks warning lamp to indicate defects in the air bag system to the driver. And fatal defect is found, air bag control unit enters overall or partial shutdown status and fault code will be stored.

Air bag control unit diagnoses following items.

Diagnosis Condition	Diagnosis Items
Start-up (ignition ON)	- Ignition TR - Acceleration - Microprocessor, RAM and ROM - Watchdog - Shutdown Switch
During Driving	- Squib resistance - Squib line short to battery and ground - Energy reserve system - Lamp output - Battery voltage - ASIC communication - Arming sensor - ASIC overheating - RAM and W/D - EEPROM

Lamp Blinking Mode

There are 2 kinds of blinking mode

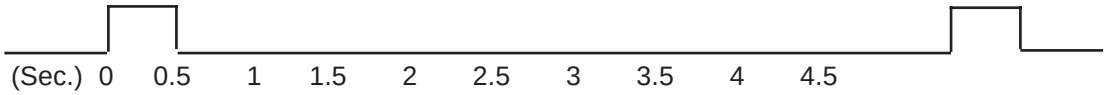
1. When system internal fault is found, the lamp will stay on.
2. The lamp will blink according to external fault and there are 2 blinking codes.

Blinking code 1 (Squib resistance fault in the driver' s air bag squib line)

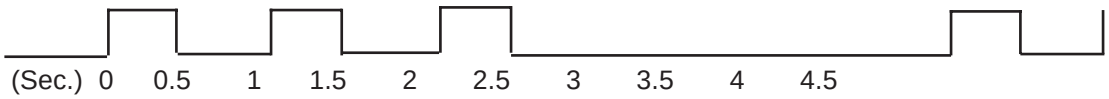
Blinking code 2 (Squib short on plus and minus in the air bag squib line)

Lamp blinking code is as follows. The last blinking will be within 0.5 sec. and 1 cycle of blinking will be repeated every 5 seconds.

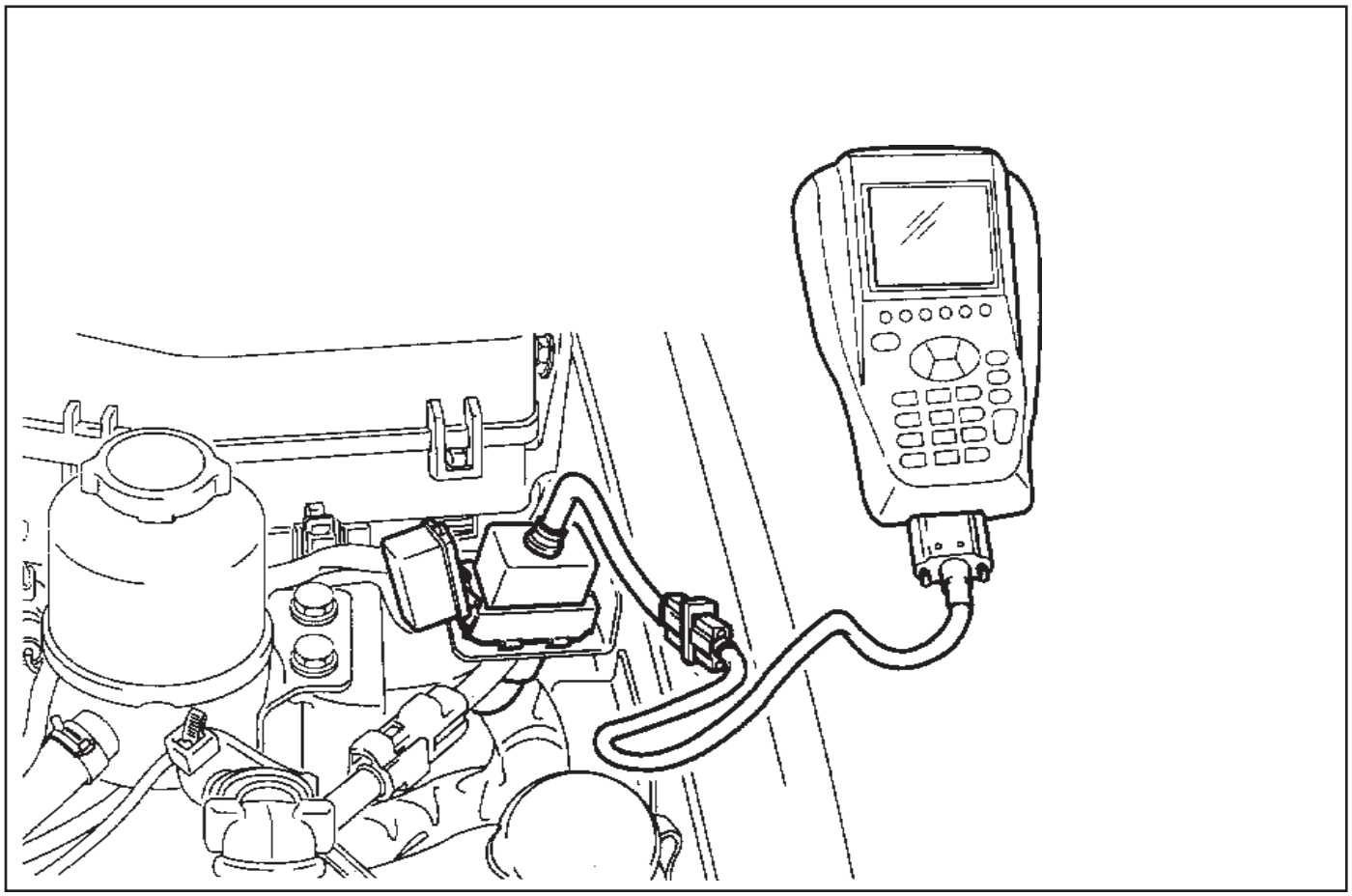
Blinking Code 1



Blinking Code 3



SELF DIAGNOSIS



1. Position the ignition switch to ‘OFF’.
2. Connect the harness connector of scanner to the diagnosis socket in engine compartment.
3. Turn the ignition switch to ‘ON’ position.
4. Select “Electronic control vehicle diagnosis” from function selection display and press ‘Enter’ .
5. Select “Musso (’98 model year)” from vehicle model selection display and press ‘Enter’ .
6. Select “Electronic air bag” from control system selection display and press ‘Enter’ .
7. Select “Self-diagnosis” from diagnosis item selection display.

   Notice

   Check sensor value of output display, if necessary.
8. Determine the fault code and trace defective component.

   Notice

   Refer to self-diagnosis list.

Self-Diagnosis List

Fault Code	Defects	Service Hint	Application
01	Driver' s squib (+) side No. 1	● Short of (+) side No. 1 in the driver' s squib circuit. ● Check connection of connector. ● Check the ECU.	○
02	Driver' s squib (+) side No. 2	● Short of (+) side No. 2 in the driver' s squib circuit. ● Check connection of connector. ● Check the ECU.	X
03	Driver' s squib (+) side No. 3	● Short of (+) side No. 3 in the driver' s squib circuit. ● Check connection of connector. ● Check the ECU.	X
04	Driver' s squib (+) side No. 4	● Short of (+) side No. 4 in the driver' s squib circuit. ● Check connection of connector. ● Check the ECU.	X
05	Driver' s squib ground (-) side No. 1	● Short of ground side No. 1 in the driver' s squib circuit. ● Check and replace the ECU.	○
06	Driver' s squib ground (-) side No. 2	● Short of ground side No. 2 in the driver' s squib circuit. ● Check and replace the ECU.	X
07	Driver' s squib ground (-) side No. 3	● Short of ground side No. 3 in the driver' s squib circuit. ● Check and replace the ECU.	X
08	Driver' s squib ground (-) side No. 4	● Short of ground side No. 4 in the driver' s squib circuit. ● Check and replace the ECU.	X
09	Energy shutdown switch No. 1	● Air bag control unit internal defects. ● Check and replace the ECU.	○
10	Energy shutdown switch No. 2	● Air bag control unit internal defects. ● Check and replace the ECU.	X
11	Energy shutdown switch No. 3	● Air bag control unit internal defects. ● Check and replace the ECU.	X
12	Energy shutdown switch No. 4	● Air bag control unit internal defects. ● Check and replace the ECU.	X
13	Ignition switch wire No. 1	● Air bag control unit internal defects. ● Check and replace the ECU.	○
14	Ignition switch wire No. 2	● Air bag control unit internal defects. ● Check and replace the ECU.	X
15	Ignition switch wire No. 3	● Air bag control unit internal defects. ● Check and replace the ECU.	X
16	Ignition switch wire No. 4	● Air bag control unit internal defects. ● Check and replace the ECU.	X

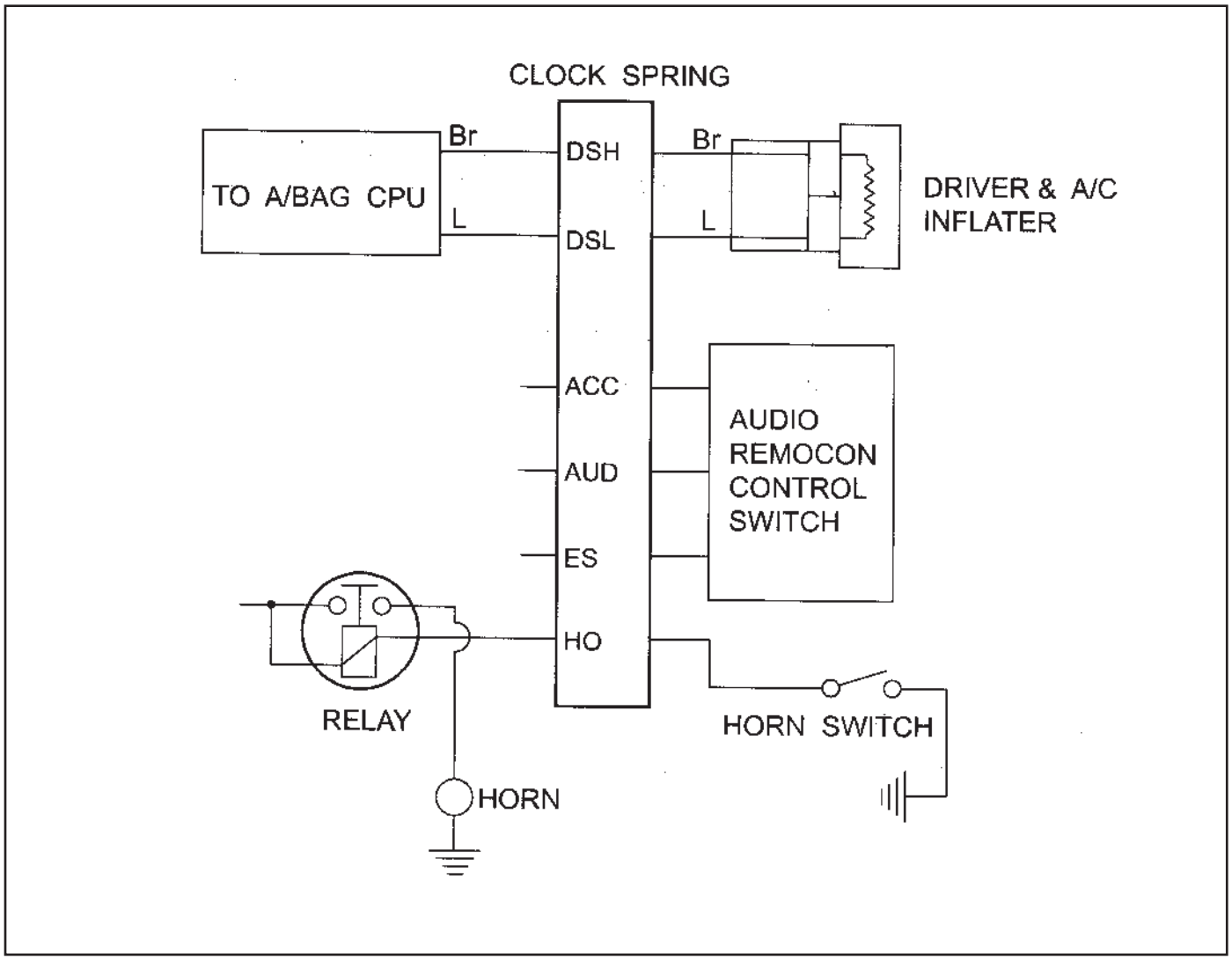
Fault Code	Defects	Service Hint	Appli-cation
17	Squib No. 1 resistance	● Driver' s squib resistance is higher than standard (4.5±0.5W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	○
18	Squib No. 2 resistance	● Driver' s squib resistance is higher than standard (4.5±0.5W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	X
19	Squib No. 3 resistance	● Driver' s squib resistance is higher than standard (4.5±0.5W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	X
20	Squib No. 4 resistance	● Driver' s squib resistance is higher than standard (4.5±0.5W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	X
21	Squib No. 1 resistance	● Driver' s squib resistance is lower than standard (1.4±0.3W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	○
22	Squib No. 2 resistance	● Driver' s squib resistance is lower than standard (1.4±0.3W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	X
23	Squib No. 3 resistance	● Driver' s squib resistance is lower than standard (1.4±0.3W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	X

Fault Code	Defects	Service Hint	Appli-cation
24	Squib No. 4 resistance	● Driver' s squib resistance is lower than standard (1.4±0.3W). ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU. ● Replace the squib wire. ● Plus side short : 7k, ground side short : 6kW.	X
25	Energy reserve No. 1 voltage	● Air bag control unit internal defects. ● Check and replace the ECU.	○
26	Energy reserve No. 2 voltage	● Air bag control unit internal defects. ● Check and replace the ECU.	X
27	Energy reserve No. 3 voltage	● Air bag control unit internal defects. ● Check and replace the ECU.	X
28	Energy reserve No. 4 voltage	● Air bag control unit internal defects. ● Check and replace the ECU.	X
29	Energy reserve No. 5 voltage	● Air bag control unit internal defects. ● Check and replace the ECU.	○
30	Energy reserve No. 6 voltage	● Air bag control unit internal defects. ● Check and replace the ECU.	○
31	Energy reserve No. 1 current off capacity	● Air bag control unit internal defects. ● Check and replace the ECU.	○
32	Energy reserve No. 2 current off capacity	● Air bag control unit internal defects. ● Check and replace the ECU.	X
33	Energy reserve No. 3 current off capacity	● Air bag control unit internal defects. ● Check and replace the ECU.	X
34	Energy reserve No. 4 current off capacity	● Air bag control unit internal defects. ● Check and replace the ECU.	X
35	Energy reserve No. 5 current off capacity	● Air bag control unit internal defects. ● Check and replace the ECU.	○
36	Condensor voltage	● Air bag control unit internal defects. ● Check and replace the ECU.	○
37	Collision times checksum	● Air bag control unit internal defects. ● Check and replace the ECU.	○
38	Driver' s acceleration sensor	● Air bag control unit internal defects. ● Check and replace the ECU.	○
39	Driver' s acceleration sensor off-set	● Air bag control unit internal defects. ● Check and replace the ECU.	○
40	Arming sensor	● Air bag control unit internal defects. ● Check and replace the ECU.	○
41	Major USA	● Air bag control unit internal defects. ● Check and replace the ECU.	○

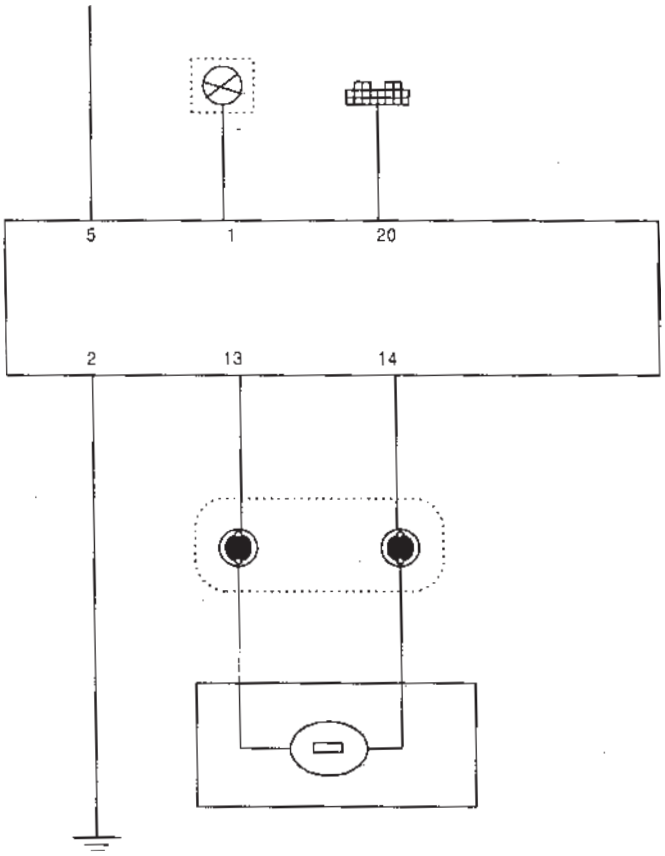
Fault Code	Defects	Service Hint	Appli-cation
42	Over heat	● Air bag control unit internal defects. ● Check and replace the ECU.	○
43	SENS	● Air bag control unit internal defects. ● Check and replace the ECU.	○
44	Standard band gap	● Air bag control unit internal defects. ● Check and replace the ECU.	○
45	Temperature sensor	● Air bag control unit internal defects. ● Check and replace the ECU.	○
46	Warning lamp	● Open/short in the warning lamp circuit. ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU.	○
47	Battery voltage	● Power wire voltage is out of standard voltage (9 - 16V). ● Check the battery for voltage and charging. ● Check related circuits for open/short. ● Check connection of connector. ● Check the ECU.	○
49	Fault code list	● Air bag control unit internal defects. ● Check the ECU.	○
50	USA communication	● Air bag control unit internal defects. ● Check and replace the ECU.	○
51	LSA communication	● Air bag control unit internal defects. ● Check and replace the ECU.	○
52	No EEPROM program	● Air bag control unit internal defects. ● Check and replace the ECU.	○
53	EEPROM checksum	● Air bag control unit internal defects. ● Check and replace the ECU.	○
54	EEPROM map	● Air bag control unit internal defects. ● Check and replace the ECU.	○
55	External watchdog 1	● Air bag control unit internal defects. ● Check and replace the ECU.	○
56	Arming sensor-no close	● Air bag control unit internal defects. ● Check and replace the ECU.	○
57	RAM check	● Air bag control unit internal defects. ● Check and replace the ECU.	○
58	System	● Air bag control unit internal defects. ● Check and replace the ECU.	○
59	External watchdog 2	● Air bag control unit internal defects. ● Check and replace the ECU.	○
60	Pulse	● Air bag control unit internal defects. ● Check and replace the ECU.	○

Fault Code	Defects	Service Hint	Application
127	Collision signal	● Air bag control unit internal defects. ● Check and replace the ECU.	○
128	Collision number	● Air bag control unit internal defects. ● Check and replace the ECU.	○

CIRCUIT DIAGRAM



AIR BAG DIAGRAM



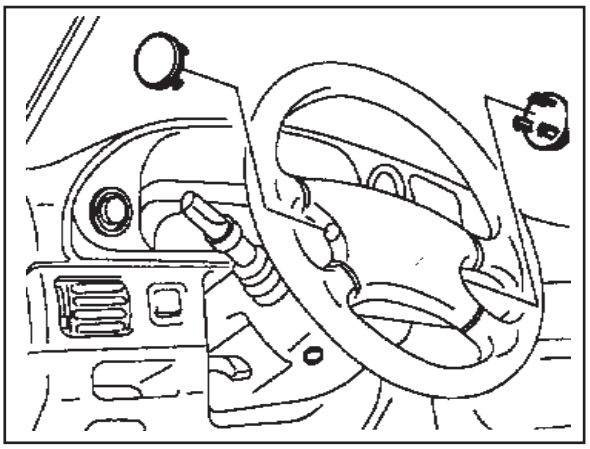
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

AIR BAG MODULE

Removal & Installation Procedure

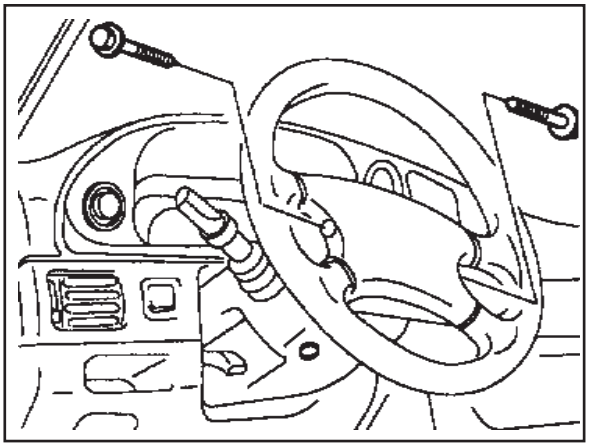
1. Remove the steering wheel rid (LH,RH) with a screwdriver.



Installation Notice

Each position mark (LH,RH) is stamped on the inner surface of the rids.

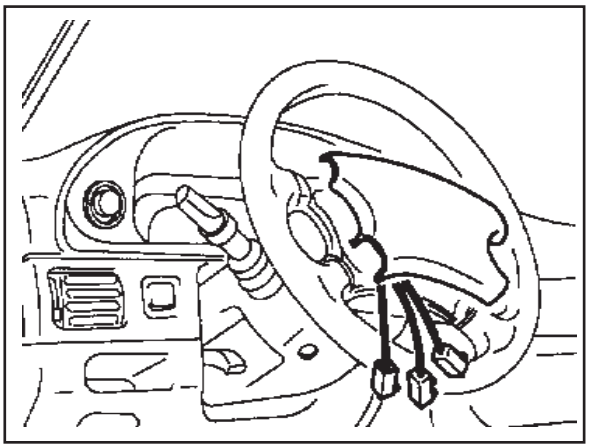
2. Unscrew the bolts from both sides.



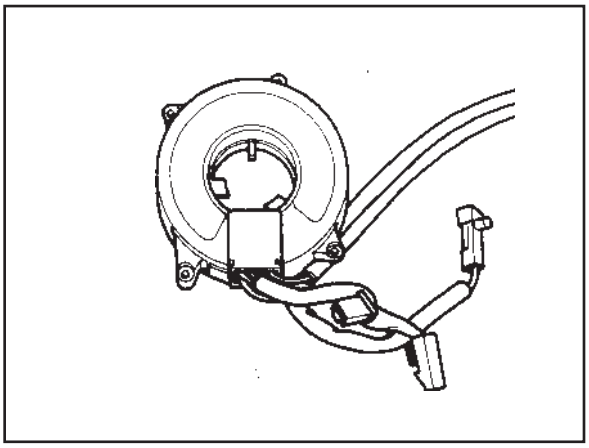
Installation Notice

Tightening Torque	7 - 11 Nm

3. Disconnect the connectors and remove the air bag module.
4. Installation should follow the removal procedure in the reverse order.



CLOCK SPRING



General Specification

Voltage		DC 12V
Rating Operating Voltage		DC 6 - 18V
Current Rating	Air Bag	10 - 30mA(6A,0.1second)
	Horn (Relay)	200 - 220mA
	Remote Control (Electronic Circuit)	15mA
Air Bag Circuit Resistance		0.16 - 0.38Ω(-40℃ - 85℃)
Isolating Resistance		5MΩ
Rotating Range		2.7 - 3.1 Rotation from neutral Position to Both Sides

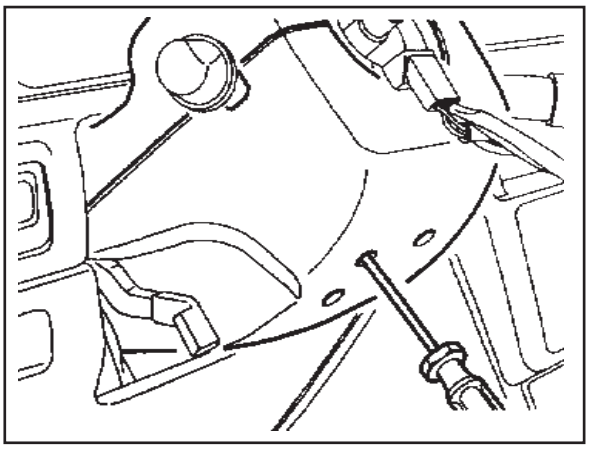
Notice

- Clock spring can not be repaired.
- Do not disassemble or modify.
- To adjust to the center position, rotate clockwise until it stops and then rotate it counterclockwise 2.3 ± 0.2 revolutions and align marks. If not, airbag system can not work normally and driver can be injured seriously.

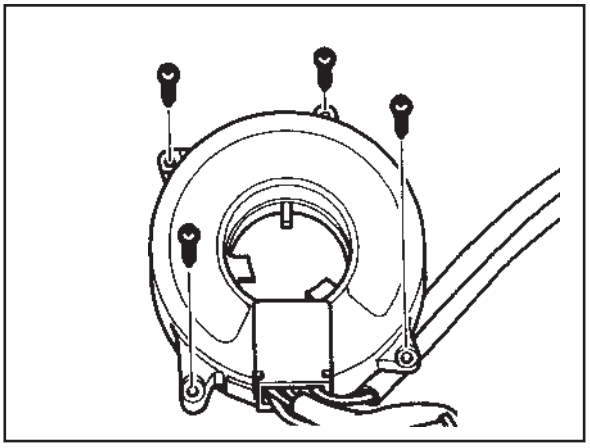
Removal & Installation Procedure

preceding work : removal of steering wheel

1. Turn the ignition switch to “OFF” position and disconnect the battery negative cable. Start the procedure after waiting over 3oseconds.
2. Unscrew 3 screws from lower cover on steering column shaft and remove the lower cover.

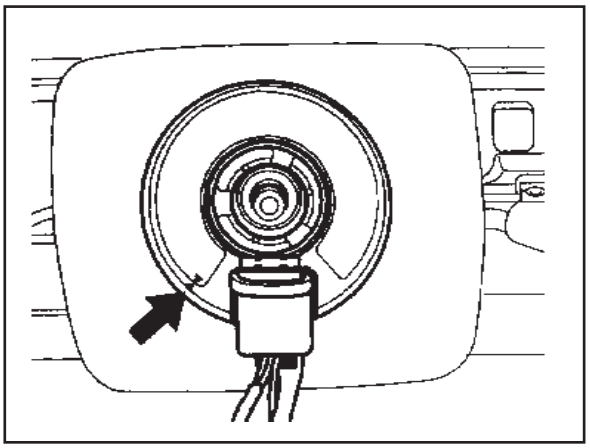


3. Unscrew 4 screws from clock spring and remove the clock spring

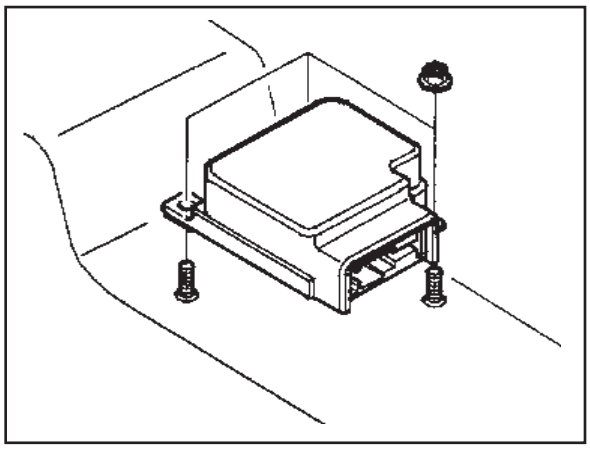


Installation Notice

- Don’t try to repair and modify the clock spring.
- When aligning the neutral position, turn to clockwise until it stops, and turn to counter clockwise until the marks are aligned



AIR BAG CONTROL UNIT(AC4)



Removal & Installation Procedure

AC4 is installed on the center portion of the front floor tunnel. Built-in accelerometer sensor detects collision and determines action or non-action and ignition time.

Notice

Do not disassemble the AC4 to repair. If defective, replace it. AC4 should not be shocked or vibrated by dropping on the ground or bumping.

Replace the AC4 with new after air bag inflation.

1. Disconnect the negative battery cable and wait for 30 seconds before starting service.

   Notice

   Though battery cable is disconnected, air bag control unit will maintain backup power for 150ms and air bag can be inflated, so wait for min.30 seconds.
2. Remove the console box and center fascia panel assembly.
3. Remove the heater control switch and audio assembly.
4. Remove the lower side panel of the driver' s portion and glove box.
5. Remove the lower main panel.
6. Release the lock lever of the AC4 connector and disconnect the connector.
7. Unscrew 3 nuts and remove the AC4.

   Notice

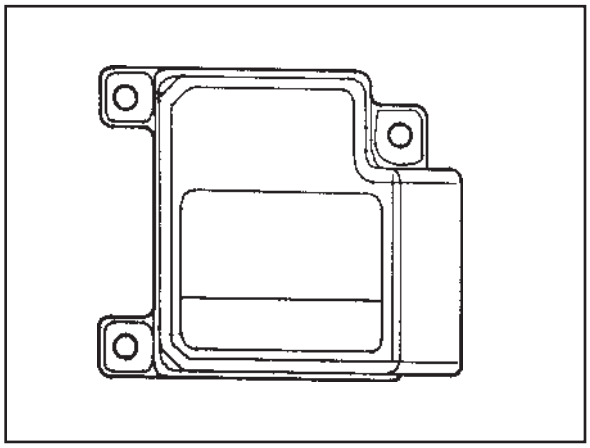
   For installation, horizontal position should be secured for the better changes of collision pulse between the vehicle body and air bag control unit.
8. Installation should follow the removal procedure in the reverse order.

Inspection Procedure

1. Check AC4 case and welt bolts for crack or deformation.
2. Check connector, lock lever and terminal for deformation.

   Notice

   Replace the AC4 with new if dust, deformation or corrosion found.



GENERAL DESCRIPTION AND SYSTEM OPERATION

INTRODUCTION

SRS (Supplemental Restraint System) air bag protects driver and passenger by inflating air bag under collision and seat belt pre - tensioner is a supplemental equipment for seat belt reducing shocks from the collision by pulling passenger' s body against seat back at the same time of air bag inflation.

Air bag unit has diagnosis functions and indicates system malfunctions to the driver by turning on the air bag warning lamp.

CAUTION

Perform the service procedures for the air bag system as ordered, if not, the air bag can be operated suddenly and it could result in damage of air bag or injury. Before service (removal, installation, checking and replacement of parts), observe the following instructions and service correctly.

1. To service, turn the ignition switch to 'LOCK' position and disconnect the negative battery cable and continue the procedures after approx. 30 seconds.
2. If the vehicle is damaged due to accident, remove the air bag ECU first to get the accident records.
3. Never use the other vehicle's air bag parts and replace with genuine part, if required.
4. Do not disassemble or repair the air bag module, air bag unit and wiring harness to reuse.
5. Replace the air bag unit or air bag module if dropped, cracked or damaged.